

Sustainable Energy Supply

It is CNPC's responsibility and mission to meet energy challenges and satisfy the ever increasing demand for low-carbon clean energy. To this end, we enhance technological innovation to continuously increase our efficiency in hydrocarbon development and utilization. We boost the natural gas industry, expand new energy business, and raise the proportion of clean energy in our energy supply. With these efforts, we strive to make contributions to the construction of a diversified, clean energy supply system and the prosperity of human society.

Energy and Future

Opportunities and Challenges

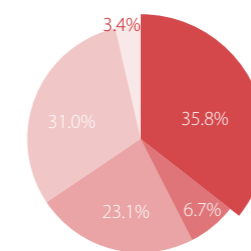
A temporary backlash against the growth of energy demand. Reeling from the impact of COVID-19, the global economy has fallen into a deep recession. The global energy demand dropped by around 5% in 2020, and it is expected to not return to the pre-pandemic level until 2023. Oil and gas will still play an important role in the global economic recovery. In the long run, population growth, urbanization and industrialization of developing countries will drive global energy demand and consumption to grow further.

Contribution of the energy transition to the "carbon neutrality" goal. The transition to a green and low-carbon energy mix has become a global consensus, and the renewable energy industry is developing rapidly amid the transition. The International Energy Agency (IEA) predicts that from 2020 to 2030, demand for renewable energy power will increase by 2/3, about 80% of the increment in global electricity demand. Low-carbon energy and efficiency improvement will help many countries and energy companies achieve the goal

of "near-zero" carbon dioxide emissions by the middle of this century.

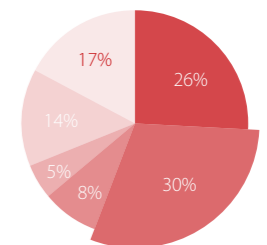
Prominent inequality in access to energy. Over 1.2 billion people worldwide still do not have access to affordable modern energy, and a large number of developing countries are still using high-pollution and high-carbon energy. Helping this group to obtain equal access to clean, low-carbon and affordable energy is a requirement for achieving the Sustainable Development Goals (SDGs) of the United Nations, but also the key to achieving global temperature control goals.

Accelerating construction of China's clean and low-carbon energy system. China is committed to a peak in carbon dioxide emissions by 2030 and carbon neutrality by 2060. The energy transition will be greatly accelerated under the guidance of the new energy security strategy and the requirements of the "Peak Carbon, Carbon Neutrality" goal. Energy enterprises are accelerating the construction of a clean, low-carbon, safe and efficient modern energy system to support high-quality economic development.



World Primary Energy Mix by 2050*

- Oil
- Coal
- Gas
- Power
- Renewable energy (incl. wind and PV)



Final Energy Consumption Mix by 2050*

- Oil
- Gas
- Hydropower
- Nuclear
- Coal
- Renewable energy (incl. wind and PV)

* Data source: World and China Energy Outlook 2050 by CNPC Economics & Technology Research Institute

Strategic Response

The world is undergoing a profound and rapid energy transition towards a cleaner, low-carbon, more efficient and diversified energy structure. Especially at a time of sluggish global economic growth and intensifying backlash against globalization, energy companies should work together to overcome difficulties, explore new opportunities and seek sustainable development. As a major player in the oil and gas industry and China's largest oil and gas producer and supplier, CNPC has been actively cooperating with the government and companies in the industry chain, and strives to provide clean, low-carbon, safe and efficient energy while meeting future energy demand, in an effort to jointly build a sustainable energy future.

We will build a "low-carbon energy ecosystem" to create new strengths for green development. Under the guidance of the new vision, we incorporate the green and low-carbon drive into CNPC's strategy. We will keep enhancing our capability to supply natural gas, foster a growth engine of green development that comprises multiple energy with oil and gas in dominance, and build a "low-carbon energy ecosystem" that integrates both fossil fuels and clean energy. We will constantly explore new low-carbon business models, develop new energy and new materials, and promote emission reduction and decarbonization in traditional businesses. We

will make further efforts to support large-scale development of geothermal resources, strengthen support for the research and application of biomass energy, consider to deploy the whole industry chain of hydrogen energy, and promote clean energy development and utilization by fully leveraging local conditions. We will also accelerate the construction of CCUS demonstration projects, foster growth poles for the green and low-carbon energy industry, and aim for achieving "near-zero" emissions by 2050 and contributing to China's efforts to achieve carbon neutrality by 2060.

We will broaden the global network of partnerships to expand new areas of cooperation. We will, further upholding the concept of mutual complementarity and mutual benefit and unswervingly following the path of "internationalization", broaden our areas of energy cooperation under the Belt and Road Initiative and the global network of partnerships, and raise the transnational index, so as to contribute to the world economy and trade recovery and development. We are committed to reshaping the global industrial chain. We will accelerate cooperation in key business areas such as natural gas and LNG integration, shale oil and gas development, and deepwater to ultra-deepwater development, intensify efforts in areas like R&D and design, marketing services, brand operations, optimize global resource allocation, and expand new areas of cooperation.

CNPC's path of green and low-carbon transition

CNPC attaches great importance to green and low-carbon transition. We have developed a green and low-carbon development path to support China's efforts to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060, and initially established a three-step overall scheme of "Clean Substitution, Strategic Succession and Green Transition", aiming to achieve peak carbon emissions by around 2025, supply of green, carbon-free energy in excess of the fossil energy consumed by 2035, and "near-zero" emissions by around 2050. To this end, we will:

- Drive the production of natural gas, a green and low-carbon energy resource, to grow rapidly while stabilizing oil production. By 2025, gas production is expected to account for about 55% of our oil and gas production, making CNPC an industry leader.
- Take natural gas as a critical contributor in the future energy system, make good use of our abundant wind, solar and geothermal resources, promote the integrated development of wind, solar, gas and electricity and the industrialized utilization of hydrogen energy, and step up the large-scale development and comprehensive utilization of thermal resources, helping CNPC transit to an integrated energy company specialized in "oil, gas, heat, electricity, and hydrogen".
- Promote the green action plan, and implement energy conservation, emission reduction and clean replacement, in order to slash carbon emissions; adopt forestry carbon sinks and CCUS for carbon removal; and offer green, carbon-free energy to the society.

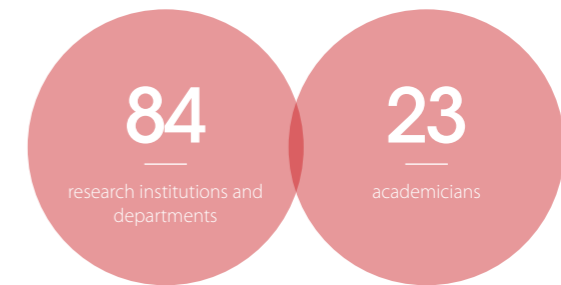
Technology and Innovation

We put more emphasis on the innovation strategy. We endeavor to deploy innovation chains based on industrial chains and promote value chains through innovation chains. We drive high-quality supply through innovation, and address global challenges such as equal access to energy, reduction of carbon emissions, and improvement of energy efficiency.

Innovation Platforms

CNPC relies on 84 research institutions and departments, including 7 at headquarters-level and 77 at subsidiary-level. CNPC also has 21 national R&D institutions and 54 Group-level key laboratories and experiment bases, covering the upstream, midstream and downstream sectors and supporting and leading the Company's sustainable development.

CNPC maintains a two-level (national-level and provincial/industry-level) skills cultivation platform and has a powerful group of 23 academicians, 23 scholars from the national "Hundred, Thousand and Ten Thousand Talents Program", 731 two-level technical experts and 1,452 skilled experts, and 30,013 researchers. Among them, 7.3% hold doctor's degree, 28.1% hold master's degree, and 48.8% hold bachelor's degree.



CNPC's Progress in Building the Innovative Scientific Research Platform in 2020

Built the National Energy R&D (Testing) Center for Long-distance Oil/Gas Pipeline Technology and Equipment and the National Energy R&D Center for LNG Technology

Built and improved 13 platforms including the Key Laboratory for Conglomerate Reservoir Exploration and Development and the Key Laboratory for Unconventional Oil and Gas

Updated and transformed the database, and optimized the information management systems at CNPC's key laboratories and test bases

Technological Achievements

Guided by major national science and technology projects in oil and gas, and centered on the Company's science and technology major projects, CNPC intensified efforts in technological innovation and formed a batch of innovative theories and new technologies/new products with proprietary intellectual property rights. CNPC also accelerated efforts in breakthroughs in a number of key and core technologies, so as to provide strong technological support for the high-quality development of the Company.

National science and technology awards

One first prize of National Science and Technology Progress Award

Two second prizes of National Science and Technology Progress Award

One National Technical Invention Award

Standard development and revision

Development of **one** international standard

Development of **one** foreign standard

Revision of **six** foreign standards



Information Technology

CNPC integrates information technology into production and operations by promoting the formation of smart oil and gas fields, smart refineries, and smart service stations. Also, CNPC has introduced information system into professional fields. Typically, CNPC has built-in IoT systems within oil and gas production, engineering technology, refining and chemicals, and equipment manufacturing, to improve the integration of automatic data collection, remote monitoring, and production & operations decision-making. In 2020, Richfit Information Technology Co., Ltd. was established to focus on the application research and service implementation of information and communications technology and provide integrated solutions.

Objective	Measures	Progress
Increase both reserves and production under complex geological conditions	<ul style="list-style-type: none"> Continue to deepen knowledge of ancient carbonate rock reservoir formation and deep zone exploration and development Innovate the theories of shale oil accumulation and volume development Innovate the "ultra-deep, weak strike-slip" fault identification technology Break the technical bottleneck in shale gas development engineering 	<ul style="list-style-type: none"> Made significant breakthroughs in oil and gas exploration in ultra-deep reservoirs in the hinterland of the Tarim Basin Discovered China's first proven shale gas area with reserves of over 1 trillion cubic meters in the southern Sichuan Basin, which is built to a large shale gas field with an annual output of more than 10 billion cubic meters Proved shale oil in place of 3 to 5 billion tons in multiple basins Maintained a stable output of 30 million tons of crude oil in Daqing Oilfield Built China's first giant uncompartimentalized oil and gas field with an annual output of 60 million tons in Changqing Oilfield Built an oil and gas field with an equivalent output of 30 million tons in Tarim Oilfield Built a giant gas province with an annual output of 30 billion cubic meters in Southwest Oil & Gas Field
Promote green production and low-carbon development	<ul style="list-style-type: none"> Implement CNPC-level major low-carbon technology projects and research on the development and application of new energy technologies Carry out CNPC's major field tests: demonstration project of key technologies for CO₂ capture, oil displacement and storage Develop the technology for comprehensive control of refining and chemical pollutants 	<ul style="list-style-type: none"> Established a geothermal utilization technology system Developed three types of new materials for photocatalytic hydrogen production Developed and implemented key technology for CO₂ flooding and storage Established the VOCs comprehensive control demonstration zone in Jilin Petrochemical and three-waste (wastewater, waste gas and solid waste) treatment demonstration zone in Ningxia Petrochemical
Improve energy efficiency, reduce costs and ensure energy security	<ul style="list-style-type: none"> Integrate information technology into the oil and gas industry Integrate technologies such as "cloud computing, big data, and Internet of Things" into the whole process of the Company's production and operation Strengthen technological research, promote refining and chemical transformation and upgrading, optimize drilling and completion technologies, and continue to reduce construction costs 	<ul style="list-style-type: none"> Digital oilfield: The Dream Cloud platform covering exploration and development, collaborative research, operation management and other business was initially built Refining and chemical upgrading: A series of technologies were developed and applied for controlling oil and increasing chemical production to increase the production of high-end lubricants, high-value-added polyolefins, high-end synthetic rubbers and other featured new products Smart sales: The cross-border integration of "service + commodity + Internet + finance" was promoted Engineering technology: An independent and efficient drilling and completion technology and equipment system was developed

Special Report

Digitalization and Intelligentization Enabling Transformation

The global energy industry is accelerating its transition to an era of digitalization and intelligentization. The new generation of technological revolution is reshaping the way we produce and live, and the traditional ways of acquiring energy need to be changed. To catch up with the new trend of accelerating energy transition, CNPC promotes the use of digital technology to empower the industry, so as to deliver cleaner and low-carbon energy to consumers while reducing costs and enhancing performance.

Promoting the collaboration between business development and R&D innovation. We coordinate the optimization of the oil and gas industry chain and the R&D innovation, and have upgraded informatization from application integration to shared services. Through overall planning for all oil and gas production sectors and in an effort to maximize the overall profitability of the upstream as well as downstream business chain and shareholder value, we optimize resource allocation, processing, logistics and marketing to achieve a comprehensive perception of market

dynamics, coordinated optimization of production and operation, a rapid response to risk warnings, and accurate and efficient decision-making. In terms of collaborative research and development, the research platform is integrated with shared professional software and other elements to improve the efficiency of multi-disciplinary and cross-organization collaborative research and development, and artificial intelligence digital tools are used to support new product development and make research more successful. A centralized and unified business management and office management platform and a production management platform covering the upstream, midstream and downstream of the oil and gas industry chain have been established. These platforms have improved management efficiency and promoted information sharing and business collaboration across disciplines and departments.

Facilitating industrial transformation and upgrading. We integrate the Internet, big data, and artificial intelligence with the Company's business to realize smart oil and gas fields, smart refining, smart marketing and smart engineering, so as to facilitate industrial transformation and upgrading. In 2020, we launched a new version of E&D Dream Cloud platform, enabling the core data of the Company's upstream business to be fully shared.



Smart engineering

Goals

- To build a lifecycle intelligent support platform for drilling engineering, and fully improve risk management and control, engineering quality, and operation efficiency.
- To build intelligent wellbores for real-time and transparent remote surface/downhole monitoring of the whole process of drilling and completion.
- To create intelligent operation sites, including intelligent drilling and digital seismic teams.

Application

Supported by CNPC's intelligent support system for engineering operations, the digital transformation and intelligent development of engineering technology business began to pay off. As of the end of 2020, the data covered 1,124 wells, more than 4,300 field problems were solved remotely, and the complex troubleshooting efficiency was improved by 47.93%.



Smart oil and gas fields

To form a new oilfield business model of "real-time monitoring, smart diagnosis, automatic processing and smart optimization" based on perception, interconnection and data fusion.

Xinjiang Oilfield built an information system covering business such as the Internet of Things for oil and gas production and a collaborative research environment to provide production dynamics in real time, support oilfield production and operation activities, vigorously promote intelligent analysis and application and support scientific decision-making.



Smart refining

To enhance the ability of perception, analysis and optimization, prediction and coordination of refineries, and build a new smart refining model featuring an efficient supply chain, lean operation, safe work control and interconnected operation and maintenance.

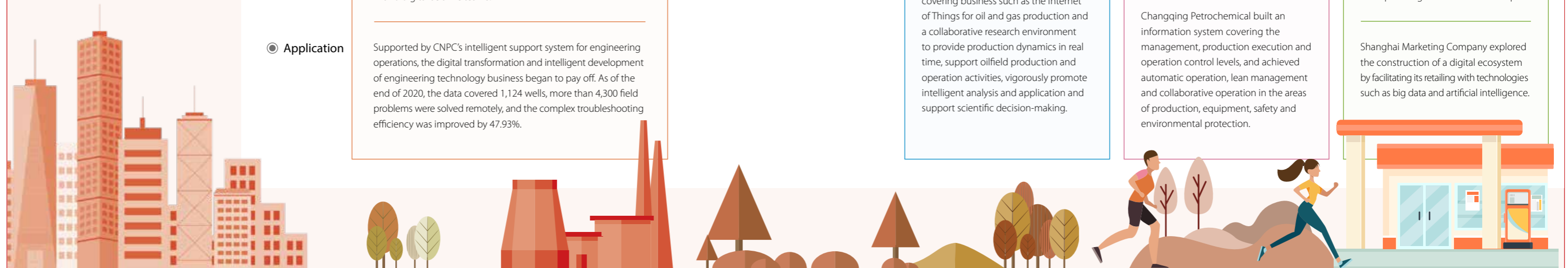
Changqing Petrochemical built an information system covering the management, production execution and operation control levels, and achieved automatic operation, lean management and collaborative operation in the areas of production, equipment, safety and environmental protection.



Smart marketing

To promote the transformation and upgrading of refined oil retailing business, build an ecosystem of "people, vehicle and life", and achieve "smart marketing, digital operations and integrated management and control" relying on digital technologies such as the Internet of Things, big data, and artificial intelligence and upholding the new retail concept.

Shanghai Marketing Company explored the construction of a digital ecosystem by facilitating its retailing with technologies such as big data and artificial intelligence.



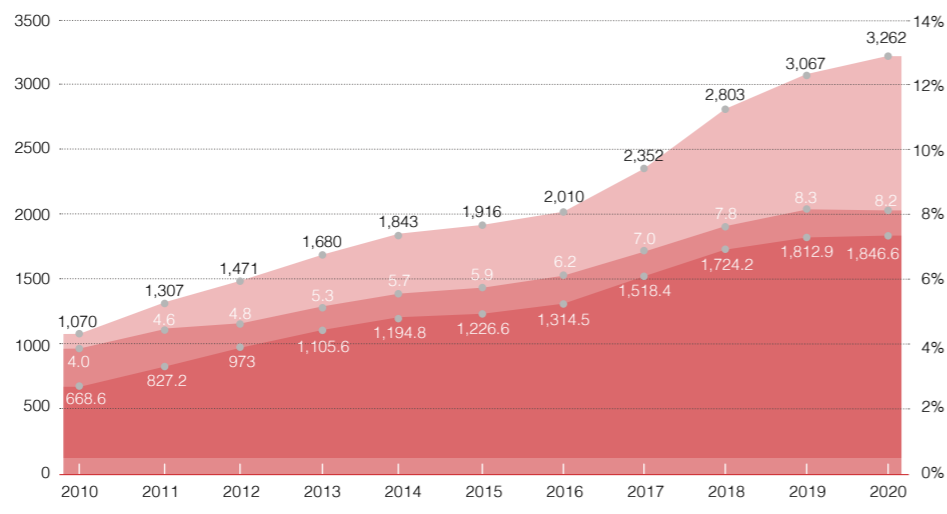
Clean Energy

In order to secure the sustainable supply of clean energy in the future, we have been vigorously developing natural gas. Particularly, we accelerate the development and utilization of unconventional natural gas and deploy the businesses of new energy and new materials in a faster manner to meet market demand for clean and high-quality energy and products. In 2020, CNPC produced more than 130 billion cubic meters of natural gas domestically, historically recording a portion of more than 50% in the oil and gas mix for the first time.

Natural Gas

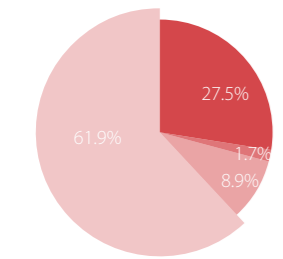
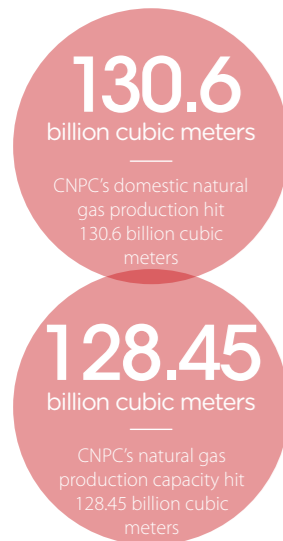
As natural gas is a bridge from fossil energy to clean energy, its development and utilization is fundamental for green and low-carbon transition. Taking natural gas as a strategic, growing and value-added business, CNPC keeps strengthening natural gas exploration and development, developing unconventional natural gas such as tight gas, shale gas and coalbed methane, and importing overseas natural gas to build a diversified energy supply system. By the end of 2020, CNPC's natural gas production capacity was 128.45 billion cubic meters.

"Green Power" Optimizing Energy Structure



- Proportion of natural gas in China's primary energy consumption mix (%)
- CNPC's domestic natural gas supply (x10⁸ m³)
- China's natural gas consumption (x10⁸ m³)

(Data source: *Energy Statistics* by CNPC's Economics & Technology Research Institute)



Composition of domestic natural gas production in 2020

- Tight gas
- CBM
- Shale gas
- Conventional gas

In 2020, CNPC produced 160.35 billion cubic meters of natural gas, including 130.6 billion cubic meters domestically, a 9.9% year-on-year increase, and accounting for 70% of China's total production. CNPC increased PNG and LNG imports while working to increase its production capacity. CNPC supplied 184.66 billion cubic meters of natural gas, a 1.9% increase over the previous year, providing strong support to the optimization of China's energy mix and the construction of a beautiful China.

70%

CNPC's share of domestic natural gas production

50.4%

Gas mix in CNPC's domestic production of oil and gas equivalent

184.66 billion cubic meters

Gas supply in 2020: 184.66 billion cubic meters

Case

Ensuring Stable Gas Supply in Winter

CNPC supplies natural gas to over 500 million people across 31 provinces (municipalities and autonomous regions) and SARs in China. Due to large seasonal fluctuations in gas consumption, securing users' demand for natural gas in winter is a matter of responsibility for the people's livelihood, and also a great test for the Company. In the 2020 winter, especially, affected by the La Niña weather phenomenon, most parts of China were hit by a lower temperature than previous years. North China saw the area's coldest temperature since the beginning of the 21st century. Despite of severe COVID-induced challenges, CNPC leveraged its advantages of integrated natural gas industry chain, optimized production organization and operation, strengthened coordinated scheduling and work connection after the pipeline network reform, and made full efforts in production, supply, storage, sales and trade. During the winter supply period, CNPC produced 61.35 billion cubic meters and supplied 97.93 billion cubic meters of natural gas to the market, up by 11.6% and 10.5%, respectively, over the previous year.

In North China, every 1°C drop in temperature requires additional **6** million cubic meters of natural gas per day

Across China, every 1°C drop in temperature requires additional **15** million cubic meters of natural gas per day

Increasing gas production. Changqing and Tarim Oilfields produced, at their maximum capacity, 35.83 billion cubic meters of natural gas during the winter supply period, representing an increase of 12.3%. Southwest Oil and Gas Field built Southwest China's first giant gas province with an annual output of 30 billion cubic meters in the Sichuan Basin.

Withdrawing more gas from gas storages. Five gas storages (incl. Shuangtuozi gas storage in Jilin Oilfield) were built, further enhancing our capacity of gas supply. In the 2020 winter, a total of 11 billion cubic meters of natural gas was withdrawn from CNPC gas storages, representing a y-o-y increase of 4.2 billion cubic meters or 60.9%; the maximum volume of natural gas withdrawn for peak shaving exceeded 130 million cubic meters.

Coordinating the supply of LNG. LNG terminals in Dalian, Tangshan and Jiangsu delivered a maximum of 119 million cubic meters of LNG per day, effectively meeting the peak demand in the Beijing-Tianjin-Hebei, Yangtze River Delta, Northeast China and other regions.

Ensuring the import of gas. CNPC maintains close communications and regular exchanges with Shell, ExxonMobil and other suppliers to ensure a stable supply of gas.


Reducing self-use gas. To guarantee gas consumption for people's livelihood, CNPC adjusted the fuel structure of refining and chemical production, slashed self-use gas, and shut down self-owned LNG plants and fertilizer production facilities.

CNPC's Measures to Secure Resource Supply in Special Periods in 2020

Resource supply for spring plowing	<ul style="list-style-type: none"> Increasing the supply of diesel oil. From the beginning of 2020 to mid-March, CNPC delivered a total of 15.28 million tons of diesel oil for spring plowing, 1.97 million tons more than the volume at the beginning of the year. Guaranteeing the supply of agricultural materials by virtue of our sales network. In cooperation with the agricultural materials producers, CNPC's 23 sales companies supplied 149,000 tons of fertilizers during the period of spring plowing.
Resource supply for work resumption in Beijing	<ul style="list-style-type: none"> Effectively coordinating production, transport and marketing to increase the supply. In April, CNPC delivered a total of 42,000 tons of gasoline and diesel oil to Beijing.
Resource supply during the Labor Day	<ul style="list-style-type: none"> Increasing the delivery from refineries. Refineries directly subordinated to CNPC delivered a total of 6.227 million tons of refined products from April to May. CNPC actively coordinated with the railway and shipping organizations to ensure the fuel delivery to service stations, with a total of 7.09 million tons of gasoline and diesel delivered. Ensuring the supply to key areas. CNPC strengthened the supply of resources to tourist attractions and refueling stations along arterial roads, with emergency supply plans in place.
Resource supply for responses to heavy rainfall and flood disasters	<ul style="list-style-type: none"> Guaranteeing the stable supply of resources. CNPC delivered 58,000 tons of gasoline and diesel oil to five provinces along the Yangtze River for flood relief.
Resource supply during the National Day and the Mid-Autumn Festival	<ul style="list-style-type: none"> Maintaining a higher stock based on the demand estimate. Our sales enterprises increased their stock to 11.03 million tons before the holidays, representing an increase of 4.62 million tons year-on-year. Keeping multi-resource supply measures and scheme. In Beijing, where the demand for refined products was expected to rise greatly during the holidays, CNPC ensured a maximum daily resource delivery of over 3,200 tons. Integrating the means of transportation, such as railway, shipping and pipeline. During the holidays, CNPC ensured its railway transport volume in a month not less than 3.5 million tons.


Unconventional natural gas

Shale gas



CNPC produced 11.6 billion cubic meters of shale gas, representing a y-o-y increase of 3.58 billion cubic meters. The largest shale gas field in China was built in southern Sichuan, with an annual output of 11 billion cubic meters, and the daily output growing by 10 million cubic meters for three consecutive years.

Coalbed methane



- The Qinnan and Edong coalbed methane production bases contributed 2.27 billion cubic meters per year.
- CBM production amounted to 2.18 billion cubic meters in 2020

Utilization of Natural Gas and Alternative Fuels

We actively promote the comprehensive utilization of natural gas in city gas, industrial fuels, natural gas power generation, chemical feedstock and vehicle fuels. In 2020, our domestic natural gas terminal sales increased by 31.1%. To meet the demand of "coal-to-gas" users and maintain stable supply of resources, we strengthened the demand-side management to ensure the residents in seven provinces and municipalities in northern China enjoy sufficient gas supply for heating in the winter months.

Case

Coal-To-Gas Project to Improve the People's Quality of Life

China's "coal-to-gas" project has gradually expanded from the Beijing-Tianjin-Hebei region and its surrounding areas to the Fenwei Plain, covering 39 cities. It is a key to secure the Battle for Blue Skies. CNPC actively coordinates with local governments and joins hands with the partners to meet the demand of people in northern China for clean heating.

In 2020, CNPC undertook the "coal-to-gas" transformation for 420,000 households in Shijiazhuang, Xiong'an New District, Shandong and other places, benefiting nearly 2 million people. In winter, CNPC supplied 400 million cubic meters of gas, equivalent to 600,000 tons of coal, ensuring the heating in winter while mitigating the pollution caused by bulk coal combustion.

New Energy

CNPC is transitioning from a supplier of "oil and gas" to a supplier of "comprehensive energy" by increasing the proportion of clean and low-carbon energy in the energy mix and takes more active actions to address the challenges of climate change. In 2020, we set up a leading group for new energy and new materials, strengthened strategies and plans for new energy, continued to expand new energy business such as geothermal energy, solar energy, biofuels, and charging and battery swap stations. Especially, we made enormous strides in hydrogen energy.

Established Shanghai Zhongyou Shenneng Hydrogen Energy Technology Limited, and prepared for the construction of the first oil-hydrogen station in Shanghai Lingang New Area	Entered into a cooperation agreement for the 70MPa hydrogen refueling station project to promote the construction of demonstration hydrogen refueling stations	Supported the hydrogen energy supply for Beijing and the 2022 Winter Olympics, by arranging and constructing hydrogen refueling stations at the Capital Airport, along the Beijing-Zhangjiakou Expressway and parking spots for the 2022 Winter Olympics hydrogen fuel vehicles, laying out a number of high-speed hydrogen corridors, and building a proprietary core technology system and standard system for key materials
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Hydrogen refueling station serving the 2022 Winter Olympics

Green Products

We optimize the energy consumption structure by upgrading energy products. The Company's refineries fully supply National VI standard gasoline and diesel to meet the market demand for high-quality oil. The manufacturing skills of downstream green chemical products and the level of green management throughout the life cycle continue to improve, effectively supporting the country in achieving its air pollutant emission reduction targets.

Climate Change

We respond to the *Paris Agreement* adopted by the 2015 United Nations Climate Change Conference, and embrace the goal of limiting global warming to less than 2 degrees Celsius by the end of this century. We actively contribute to China's efforts to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060. We take the initiative in international climate governance, and actively respond to climate change.

CNPC Low-Carbon Development Progress

Strategic goals	Supporting measures			
<ul style="list-style-type: none"> By 2030, the supply of natural gas and other clean energy is further increased, and the proportion of the Company's domestic natural gas output in its domestic primary energy output and that of new energy and renewable energy output in its domestic primary energy output rise By 2050, the proportion of the Company's domestic natural gas output in its domestic primary energy and that of new energy and renewable energy output in its domestic primary energy output continue to grow 	<p>1. Integrate green, low-carbon development into corporate strategy</p> <ul style="list-style-type: none"> Based on the carrying capacity of resources and environment, rationally arrange industrial planning and project construction, improve policies for low-carbon development by fields and phases, introduce a carbon cost assessment mechanism, carry out carbon assessment of construction projects, and reduce arrangements for and investment in high-carbon emission businesses Conduct stress tests on related assets of the enterprises and strengthen management measures in the affected assets Improve the phasing-out mechanism, and gradually phase out oilfields/blocks with high energy consumption and high water cut and the refining and chemical plants with high carbon emissions per unit of product and low market demand 	<p>2. Integrate low-carbon development into corporate management</p> <ul style="list-style-type: none"> Improve green and low-carbon development systems and mechanisms, and conduct special supervision (especially on carbon emission intensity, implementation of tasks and measures, and progress of pilot/demonstration projects) to ensure the realization of targets and tasks Improve the measurement and inspection system for greenhouse gas emissions, check greenhouse gas emissions, regularly update the list of greenhouse gas emissions, and engage third parties in verification and evaluation Establish a greenhouse gas control system, improve the carbon emission quota control and carbon asset centralized management and control modes, plan and implement emission control projects/measures to effectively reduce emission intensity and ensure that risks are brought under control 	<p>3. Integrate low-carbon development into technological innovation</p> <ul style="list-style-type: none"> Reinforce the synergy of enterprises, colleges/universities, research institutes and users to accelerate the translation and popularization of cutting-edge technology and research findings Build a low-carbon technology support platform and enhance the independent technological innovation capacity in terms of energy conservation, emission reduction and environmental protection. By 2030, the technical research on low carbon will share 10% of the Company's investment Apply the green manufacturing technology to provide low-carbon products, and promote the lifecycle ecological environmental protection and resources/energy saving Communicate and cooperate with international organizations such as OGCI in respect of reducing methane emissions, promoting CCUS, improving energy efficiency, and reducing the carbon emissions intensity in the transportation sector 	<p>4. Integrate low-carbon development into social responsibility</p> <ul style="list-style-type: none"> Promote the concept of low-carbon development, take measures for ecological civilization, support low-carbon activities, and commence the construction of low-carbon demonstration zones Establish a low-carbon development & climate investment fund, innovate business models and operating methods, and strengthen cooperation with social capital, local governments/enterprises and community, in order to build a low-carbon society Implement low-carbon demonstration projects in line with the Belt and Road Initiative, participate in South-South cooperation on climate change, and create the image of a responsible energy company
<p>CNPC Low-Carbon Development Plan</p>				
<p>Progress in 2020</p> <ul style="list-style-type: none"> The Company's domestic natural gas output accounted for 50.4% of its domestic oil and gas equivalent output The Company's domestic greenhouse gas emissions per unit of oil and gas production decreased by 9.65% from the 2019 level The Company's methane emission intensity decreased by 6% from the 2019 level 	<p>Enhanced carbon trading performance and carbon asset management</p> <ul style="list-style-type: none"> In 2020, all CNPC enterprises on the list of the national carbon emissions trading market fulfilled their contracts 	<p>Strengthened management on carbon emissions</p> <ul style="list-style-type: none"> Implemented the <i>Green Action Plan</i> Issued the <i>Methane Emission Control Action Plan</i> <p>Improved efficiency</p> <ul style="list-style-type: none"> Enhanced capabilities in energy control <ul style="list-style-type: none"> Promoted energy control in 38 oil and gas fields and refineries Performed training on energy control standards, with more than 200 trainees Invested RMB 660 million in technical upgrading for energy and water conservation Tested and accessed the energy efficiency of more than 12,498 energy-consuming devices such as pumping units, heating furnaces, and pump units Continued to improve the greenhouse gas emission accounting and reporting management platform 	<p>Reduced emissions by technological means, lowered greenhouse gas emissions in production processes, and promoted CCUS</p> <ul style="list-style-type: none"> Developed 18 key technologies and technical packages through low-carbon researches, established 16 demonstration projects and 9 demonstration areas, and improved the low-carbon standard system Initiated major technical research projects such as "Key Technologies and Application of CO₂ Capture, Flooding and Storage" and "Demonstration Project of Key Technologies for CO₂ Capture, Flooding and Storage", and accelerated breakthroughs in core technologies Carried out research on key CCUS technologies, and supported CCUS industrial testing in Jilin as well as the implementation of demonstration projects in Changqing and Xinjiang Stored more than 1.9 million tons of carbon dioxide in the CO₂-flooding demonstration project in Jilin Oilfield <p>Participated in activities under the OGCI framework</p> <ul style="list-style-type: none"> Basically formed the plan for Xinjiang CCUS Industrial Hub Released the <i>OGCI China CCUS Commercialization White Paper</i> Organized and held 9 roundtables on emission reduction in transportation Released OGCI Annual Report 2020 jointly with member companies 	<p>Build carbon sink forests</p> <ul style="list-style-type: none"> Established China's first carbon neutral forest in Ma'anshan, Daqing City Had a total green area of 286.6 million square meters Planted a total of 2.811 million trees in 2020 Provided support for local landscaping, with a green area of 727.23 hectares and 1.656 million trees planted

In 2020, we

- completed the accounting and reporting of annual greenhouse gas emissions data
- set methane emission targets: to reduce methane emission intensity by around 50% by 2025 from the 2019 level, and keep in line with world leading companies in respect of methane emission

50%

Plans and initiatives for greenhouse gas emission reduction and control supported and participated in by CNPC

- Paris Agreement
- China's National Program to Address Climate Change
- National Plan on Climate Change (2014-2020)
- China Technology Strategic Alliance for CO₂ Capture, Utilization and Storage Technology Innovation (CTSA-CCUS)
- Oil and Gas Climate Initiative (OGCI)
- Carbon Peak and Carbon Neutrality Declaration in China Petroleum and Chemical Industry

Carbon Emission Management

We pay close attention to greenhouse gas emissions. In 2020, we included "green and low-carbon" in our development strategy, implemented the *Green Action Plan and the Methane Emission Control Action Plan*, strengthened carbon emission management, improved the carbon emission control system, and took an active part in the cooperation with global oil and gas industry to cope with climate change.

Case

CNPC Actively Participates in OGCI Activities to Promote Carbon Emission Reduction in the Industry

As the sole member of OGCI in China, CNPC is deeply involved in international cooperation to address climate change, and works with other OGCI members to achieve low-carbon transition in the oil and gas industry. CNPC has developed the CCUS business development plan for the "14th Five-Year Plan" period.

Fulfilling emission reduction commitments

Chairman Dai Houliang issued the *OGCI-CEO Joint Open Letter*, reiterating the commitment of OGCI and its member companies to continue to fulfill their commitments and actively promote carbon emission reduction actions amid the challenge of COVID-19 and low oil prices.

Together with other OGCI member companies, we issued a plan to reduce the average carbon intensity of the upstream sector. We undertake to reduce carbon intensity of our operations to 20 to 21 kg CO₂ equivalent per barrel of crude oil by 2025, down from a baseline of 23 kg in 2017, and reduce the average methane intensity to below 0.25%, with the ambition to achieve 0.2%.

Issuing China CCUS Commercialization White Paper

We conducted benchmarking studies on CCUS commercialization policies at home and abroad and proposed a targeted plan for China's CCUS commercialization. We also held a seminar titled "CCUS Commercialization White Paper: Goals and Actions for Oil and Gas Industry".

Promoting CNPC's methane emission control and CCUS projects

We issued the *Action Plan for Methane Emission Control*, and deployed and implemented the "Seven Major Projects" to push our methane emission control to a world-class level. We completed the research on the CCUS Industrial hub in Junggar Basin. The design of the first phase of CCUS with a capacity of 1 million tons/year has passed expert verification, and the second phase will have a capacity of 3 million tons/year, with a potential of 10 million tons/year. This has been affirmed by the Ministry of Ecology and Environment and the National Energy Administration.

Committing to sustainable transportation

As one of the leading companies of the OGCI transportation working group, we worked with member companies to select prior low-carbon fuel routes, invited global oil, hydrogen and road transportation sectors to the roundtable forum on emissions reduction in transportation, and hosted the online "Forum on Opportunities for Sustainable Transportation Development".

Industry exchange

We conducted in-depth exchanges with domestic and foreign counterparts and professional organizations on low-carbon transition and carbon emission reduction. We organized and hosted 9 roundtable forums on emission reduction in transportation; we also worked with member companies to release the OGCI Annual Report 2020.

Main Measures to Strengthen Carbon Emission Management

- Optimized the industrial structure and eliminated backward production capacity for energy saving and emission reduction
- Optimized the energy mix (clean energy substitution)
- Strengthened greenhouse gas recycling (CO₂ utilization, methane recovery in oil and gas fields)
- Formulated carbon emission rules to regulate the enterprise's carbon emission
- Conducted greenhouse gas emission monitoring, reporting and verification (MRV)

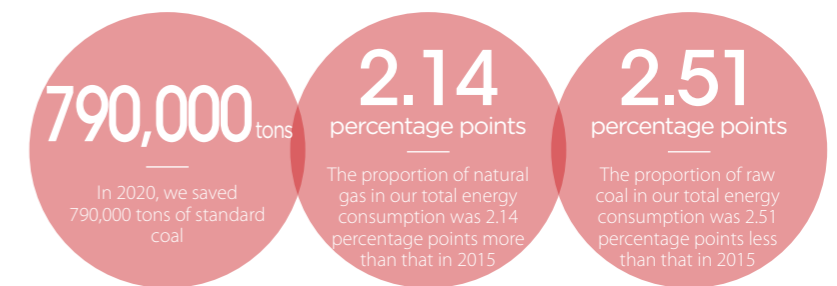
Carbon Emission Reduction During Production

While supplying society with clean oil products, we pay high attention to the optimization of our own energy consumption mix. We also address our carbon emissions and our carbon footprint during production and operation, and endeavor to reduce the consumption of fossil fuels and reduce energy intensity. We regard energy efficiency as the resource of first priority, enhance oil and gas commodity rates and energy utilization efficiency, and accelerate green and clean replacement. In Huabei Oilfield, Tarim Oilfield and other areas, we use renewable energies such as geothermal energy and solar energy to reduce carbon emissions during production.

Improvement of energy efficiency

We developed and implemented the *CNPC Work Plan for Saving Energy, Reducing Consumption and Enhancing Efficiency*, and continued to promote conservation of water, electricity and energy, and consumption reduction, thereby driving the Company's high-quality development.

- Promoted intensive and efficient development of oil and gas, strengthened the optimization of refining and chemical energy and water, and enhanced the system optimization and comprehensive utilization of resources
- Strengthened energy-saving technological transformation, and invested RMB 660 million in technological upgrading for energy/water saving
- Promoted energy management and control
 - Implemented energy control in 38 oil and gas fields and refineries
 - Performed training on energy control standards for more than 200 trainees
- Tested and accessed the energy efficiency of more than 12,498 energy-consuming devices such as pumping units, heating furnaces, and pump units



Market-based Mechanism for Carbon Saving

We actively participated in carbon trading activities to achieve carbon emissions reduction through market-based mechanisms. We are the co-founder of the Tianjin Climate Exchange (TCE), the first comprehensive emissions trading institution in China. The energy saving and emissions reduction projects developed by TCE could save more than 200,000 tons of standard coal annually, equivalent to over 500,000 tons of CO₂ emission reduction. In 2020, all CNPC enterprises on the list of the national carbon emissions trading market fulfilled their contracts.

Energy Cooperation

Upholding the principle of “mutually beneficial cooperation for common development”, we give play to our advantages in integrated businesses, capital, technology and managerial expertise, and cooperate with host governments and partners in upstream, midstream and downstream. While facilitating local access to energy, we help the local areas turn their resource advantages into economic advantages and address local energy challenges, in order to meet local energy demand and maintain regional energy security.

International Energy Cooperation

We work hand in hand with the host governments and our partners to fight against COVID-19 and guarantee the stable operation of cooperation projects. We endeavor to make steady progress in overseas oil and gas cooperation. In 2020, we made fresh breakthroughs and new progress in the risk exploration of the Chad project, the progressive exploration of the Kazakhstan PK project and the Ecuador Andes project, and the deepwater exploration in Brazil. CNPC produced 176.642 million tons of oil and gas equivalent overseas, with CNPC equity production of 100.093 million tons. CNPC made contributions to meeting energy demand in host countries and supporting local economic development.

E&P Joint Ventures in China

We continue to make steady progress in cooperation with international partners in developing oil and gas resources in China. While deepening cooperation in conventional areas, we reinforced cooperation with IOCs in shale gas and other unconventional resources. Projects including the Changbei Project, Zhaodong Project, South Sulige Project and Chuanzhong Project were in steady progress. Our domestic oil and gas production equivalent in cooperation with international partners amounted to 2.95 million tons in 2020.

International Trade

By optimizing the resource mix, we make every effort to promote the high-quality development of international trade. In 2020, we conducted international trading in over 80 countries/regions around the world, enhanced the operating capabilities of the three operation hubs in Asia, Europe and the Americas, and reported 490 million tons of international marketing volume.

